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that the subarseniate differs from the neutral arseniate, merely by the substitution of an atom of soda for an atom of water; for the latter salt contains 25 atoms of water.

The author's experiments on the composition of the subarseniate of soda,—the results being reduced to the hypothesis, that it contains 23 atoms of water,—represent it as formed, (per cent.) of arsenic acid, 27·69; soda, 22·55; water, 49·75. The subphosphate of soda was found to consist (per cent.) of subsesquiphosphate, 43·97; water, 56·03; the soda in the salt amounting to 24·87.

The author attempted to determine the quantity of phosphoric acid in this salt, by direct precipitation by nitrate of silver, but could not obtain rigorously accurate results; for the subphosphate of silver carried down with it a portion of the nitrate, which washing could not entirely separate. He likewise failed in his endeavours to obtain pure subphosphate and subarseniate of potash.

The subarseniate of barytes appeared, by a single experiment, to be composed, (per cent.) of arsenic acid, 32·06; barytes, 67·94: from which the salt would seem to contain an excess of base; for by theory, the subsesquiarseniate of barytes should be composed of, acid, 33·4; base, 66·6.

When solution of muriate of lime is poured into an excess of solution of phosphate of soda, or when phosphate of lime, dissolved in muriatic acid, is precipitated by ammonia, a gelatinous mass is formed, which has been called the subphosphate of lime of bones; the composition of which is singular, consisting, on the simplest view that can be taken of it, of 3 atoms of phosphoric acid, and 4 of lime. It was noticed by Berzelius.

The author thinks the anomalous composition of this salt may in some measure be explained by considering it as consisting of 1 atom of the neutral, and 2 atoms of the subsesquiphosphate. According to Berzelius, calcined ox-bones are composed of such a phosphate of lime, with a little carbonate of lime; but a doubt arises of the accuracy of this view, from the fact, that the presence of carbonic acid in the calcined phosphate of bones is no proof of the existence of that acid in the same, previous to calcination.

The earth of bones, after calcination at a high temperature, contains phosphoric, and not pyrophosphoric, acid; the excess of base preventing the transition.

The author's analysis of subarseniate of lead, formed by the gradual addition of solution of acetate of lead to solution of subarseniate of soda, afforded a striking confirmation of the atomic weight of arsenic, deduced by Berzelius from his analysis of arsenious acid by sulphur.

A paper was read, entitled, "Some Observations on the Structure of Shells, and on the Economy of Molluscous Animals." By John Edward Gray, Esq. F.R.S.

The author distinguishes two kinds of structure in shells; the one in which the calcareous matter is crystallized, composing what Mr. Hatchett has called the *porcellaneous structure*; and the other, in which it is deposited in grains intermixed with a large proportion of

animal matter, constituting the *nacreous* or *granular structure*. The former class of shells, which includes most of the turbinated univalves, may be divided into those in which the crystals are rhombic, and those in which they are prismatic. The first are composed of three distinct layers, the laminæ of which are disposed differently in the intermediate layer from what they are in the outer and inner layers. The direction of the fibres of each being nearly at right angles to that of the contiguous layer, the strength of the shell is rendered considerably greater than if the arrangement of the fibres had been uniform in each plate. The comparative thickness of the three plates varies in different shells; but the central plate is generally the thickest. The outer plate is the thinnest; and, in some shells, is easily detached, in consequence of the deposition underneath it of a white film of less coherent matter. It often happens, that when the animal arrives at its full size, it deposits layers of shell either on the lips or the columella: and in some, as the *Cypræœ*, an additional coat, which is harder, more compact, and differently coloured from the rest of the shell, is formed by an extension of the mantle, and laid on the outside of the shell; the part, where the two reflected portions of the mantle meet on the back being marked by what is termed the *dorsal line*.

Besides these component parts of turbinated shells, there is often deposited on the sides and interior part of their cavities, especially of the upper whorls, a transparent calcareous concretion. In shells of which the spires are elongated and acute, as in the *Turritellæ*, this deposition entirely fills up the cavity of the upper whorls; thus rendering solid the tips, which, from their small size and original thinness, would otherwise have been very liable to be broken. In other cases the animal, instead of filling up this upper cavity, suddenly withdraws its body from the upper whorls, and then forms a concave septum, by which the vital communication between the body and the apex of the shell being cut off, this part decays as a dead shell, and gradually falls to pieces.

Shells having a prismatic crystalline structure are formed of short fibres, everywhere perpendicular to the surface. The prisms are mostly hexagonal. Shells of a granular structure present a more uniform texture; the plates of animal matter they contain being very thin, and closely compacted together. They have generally a pearly or iridescent lustre, arising from this peculiar conformation. The particles of disintegrated *Placunæ* are employed by the Chinese as silver in their water-colour drawings. In many shells belonging to this class, as in the Oyster, the animal matter, being more abundant, produces a distinctly laminated texture.

It has been generally believed, and sometimes strenuously maintained, that molluscous animals have not the power of absorbing the matter of their shells when it has once been deposited. The author brings forward a large mass of evidence in proof of their frequently exercising this power. In the Cone and the Olive, all the septa between the whorls inclosed in the body are very thin and transparent, and, when compared with the corresponding portions of the outside,

adjacent to the apex, are found to have lost the outer and the middle layers, the innermost alone remaining. In the *Auriculæ*, this inner layer also is removed, leaving a simple cavity in the upper half of the shell. The absorption of the substance of these internal portions of shell gives more space for the body, at the same time that it renders the shell much lighter, without any diminution of its strength; the body being sufficiently protected by the outer whorl. In the *Murices*, and other shells having ridges or spines on the front of the whorls, which, in the progress of the growth of the shell, the succeeding whorls would necessarily overlap, these appendages are generally absorbed, to make way for the succeeding whorls; their absorption being effected by the edge of the mantle as it comes in contact with them. Thus do many species of Mollusca absorb, at regular epochs of their growth, certain parts of their shells, which had, at a preceding period, been deposited about the lip in the form of ribs or teeth. Mollusca have also the power of forming excavations in the shells of other animals of this class, and sometimes of other individuals of the same species: many instances of these facts are adduced by the author; among which one of the most curious is the history of the *Spiraglyphus*, which, in the progress of its enlargement, absorbs a tubular portion of shell which it had formed at an early period of its growth. They also excavate portions of solid rock in providing for their habitation. Molluscous animals, however, do not appear to be capable of removing extraneous obstacles which oppose their progress in the formation of their shell; in proof of which, various examples are adduced of foreign bodies being inclosed in the layers of shells. The author produces evidence of the secretion of the materials of the shell by other parts than the mantle, and in particular by the upper part of the foot. The operculum is in this way formed, in a manner exactly similar to shell, by the back of the foot: and its various modifications of form, the author remarks, afford important characters for the systematic classification of this department of Natural History.

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June 20, 1833.

WILLIAM GEORGE MATON, M.D., Vice-President, in the Chair.

His Grace the Duke of Buccleuch, and the Right Hon. Sir Thomas Denman, were elected Fellows of the Society.

Professor Stromeyer, Foreign Memb. R.S., presented two specimens, one of the coarse-grained, the other of the fine-grained variety, of the remarkable mass of iron lately discovered near Magdeburg, and an account of which had been laid before the Royal Society of Göttingen on the 14th of last month. This iron was found, in several detached lumps, about four feet below the mould, by Mr. Kote, who considered himself the more authorized to pronounce it meteoric, as, in the chronicles of Magdeburg, the descent of a fiery meteor is recorded as having happened in the year 998. Professor Stromeyer has subjected this iron to a minute analysis, the results of which are very interesting, inasmuch as, besides the alloy of nickel and cobalt, usu-